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ABSTRACT

This monograph provides a detailed description of the child about whom and for whom the activities of the elementary school industrial arts program are directed and of the role of industrial arts in the elementary school curriculum. The first section is a detailed description of the child from age three to thirteen and includes general physical characteristics, emotional and social traits, motor and intellectual development, and examples of observable patterns of behavior not detailed as unique characteristics. The next section is a model (using age five as an example) that matches expected behaviors (kindergarten) with provisions (educational experiences). The third section discusses the role of industrial arts activity as part of the elementary school curriculum. The integration of industrial parts as part of the total curriculum is advocated. Among the benefits to elementary school children that are cited are these: orientation to the world and opportunities to use and develop various skills, develop mind-body coordination, analyze parts to a whole, interact, and organize, plan, create, and evaluate using a variety of media. A chart lists development characteristics (ages three to thirteen) and correlates them with characteristics of appropriate technological activities. (YLB)

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THE DEVELOPMENTAL GROWTH OF ELEMENTARY SCHOOL STUDENTS AND THE ROLE OF INDUSTRIAL ARTS IN THE PROCESS

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The purposes of the council are to:

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. . . coordinate, on a national level, the efforts of all who contribute to the development of elementary school industrial arts and career education.

. . . publish materials relating to trends and issues in education for young children which will be of informational and practical use to the membership of the council.

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PREFACE

The growth and development of children has served as a guiding principle in the refinement of elementary education programs. The teacher's ability to understand patterns of physical, intellectual, and emotional development common to elementary school children is essential for effective teaching. Based on this understanding a teacher is able to deal with students as individuals and provide educational opportunities which are appropriate to facilitate development.

Industrial arts can make an important contribution to the elementary school curriculum if it is presented consistent with the patterns of growth and development. Providing experiences with technological practices can help students achieve the coping skills necessary for life in contemporary America. Activities which make the concepts of traditional school curriculum more concrete have been found to facilitate learning. Also, the fact that industrial arts activities are generally very interesting to students provides considerable motivation for learning.

The purpose of this monograph is to summarize what is known about the growth and development of children and suggest the implications this knowledge has for industrial arts activities in the elementary school. This publication should be useful to elementary teachers, industrial arts consultants, principals, curriculum coordinators, and teacher educators.

Dr. E. Keith Blankenbaker

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The Development Growth Of Elementary School Students And The Role Of Industrial Arts In The Process

One can review the books currently on the bookshelf devoted to the elementary school industrial arts and find less than twelve inches of shelf occupied. All of these texts in some form or another devote pages or a short chapter to the growth and development of the child. The authors consume the majority of their pages with suggested activities and tool skills for children.

The most comprehensive coverage of the child, his growth, and development, is found in Scobey's **Teaching Children about Technology.**

Scobey (1968) devotes the better part of two chapters to the role of industrial arts in the elementary school curriculum, both as a related content area and as a separate unit of study. The growth and development of the child per se is not detailed. (Scobey, 1968)

Gerbracht and Babcock (1969) in the early pages of **Elementary School Industrial Arts** write about the characteristics of child development in the elementary grades. Their approach is one which briefly looks at the physical, intellectual, emotional, and social aspects of the child without reference to age or stage of development.

Theses authors also devote a chapter of their book to the role of industrial arts in non-typical programs, especially those for intellectually exceptional children. This chapter covers the culturally disadvantaged, slow learner, mentally impaired, both EMR (educable mentally retarded) and TMR (trainable mentally retarded), and the above-average. Emphasis is also placed on industrial arts and its role with the physically handicapped.

Gilbert (1966) in the book, **Children Study American Industry,** devotes several pages to the nature of the child in relation to individual differences and how activities motivate children. These are a part of a chapter related to "Values and Procedures" of the elementary school industrial arts program.

Bonser and Mossman, (1935) early advocates of the elementary school industrial arts program, in **Industrial Arts for Elementary Schools** develop a chapter around "The Psychology of Industrial Arts." As part of this chapter, contemporary thoughts of the 1920's are expressed regarding "physiological factors," "mental factors," "the question of skill and of manual dexterity," "important elements of motor training," "the broaden mental aspects of constructive and investigative problems," "appreciations resulting from practical activities," "the mental stimulation of industrial arts studies," and "openmindedness resulting from participation." (Bonser & Mossman, 1935, Ch. 3)

A review of twenty-eight selections, portions of books, articles, and speeches, presented in **Elementary School Industrial Arts: Selected Readings and Resources** by Larsen and Nelson (1968) indicates a lack of professional literature at that time devoted in any depth to the characteristics of the elementary school child, grades pre-kindergarten through six.

PURPOSE AND MONOGRAPH

The purpose of this monograph is to provide an accurate detailed description of the child about whom and for whom the activities of the elementary school industrial arts program are directed and to the role of in-

dustrial arts in the elementary school curriculum. Particular attention will be given to the various stages of development from chronological age three through twelve and the developmental patterns associated with each age group.

LIMITATIONS OF MONOGRAPH

This monograph will not attempt to deal with any of the special problem students who may be part of the school population. In almost all cases these children do not fit into the typical profile of each group because of some developmental or behavior pattern discrepancy.

GROWTH AND DEVELOPMENT - Age 3-13

The first section of this monograph is a detailed description of the child from chronological age three to thirteen. The age span of three to thirteen was chosen to cover the broad spectrum of children who may exhibit characterisitcs or behavior patterns outside their chronological age group. Elementary industrial arts activities may occur from pre-kindergarten through grades five and six, depending upon school organization.

The description of each age group of children includes their general physical characteristics, emotional and social traits, motor and intellectual development, and examples of observable patterns of behavior not detailed as unique characteristics.

For each age group from age three to age thirteen, the author has attempted to list characteristics and behavior patterns which are typical. Unless otherwise specified, the statements will be applicable to both boys and girls even though the masculine pronoun is used traditionally.

Age Three - Physical Characteristics

At age three the child is growing at a very rapid rate. The child eats the same food as the other members of the family. Sometimes the food is served in a different form and he may not eat hard to digest foods. He will be self-sufficient in the process of eating except for needing assistance in cutting meat or anything which may be too large to chew as prepared. The three year old sleeps all night and he may or may not need a nap in the afternoon. Most of the time his disposition will indicate a need for sleep or activity. This child is almost always toilet trained, especially if the emotional and physical influences have been present to support such achievements.

Age Three - Emotional and Social Traits

The three year old is usually a cooperative, happy child. Sometimes a complaint may come forth, but not as an everyday part of life. The child has learned to do more than the two year old so he is usually less frustrated. He can share toys and wants his turn. He has become interested in getting along peacefully with his peers and has developed a need for atttention and praise. Tempers begin to show at age three, but not frequently. The three year old has a developing imagination and will be found talking to himself, his toys, or even an imaginary companion. Many children instill a great deal of faith and trust in their imaginary friends who live in strange places, such as driveway culverts, up in trees, or under rocks. Most three year olds have better controlled ability to verbalize and can be reasoned with to a greater extent than the two year old. Most children this age are proud of their verbal accomplishments.

Age Three - Motor and Intellectual Development

The age of three finds a child who can handle a finer manipulation of his play materials. This child is more sure and nimble of his feet and with the use of his hands. He can alternate feet going upstairs if the steps are not too high or too steep. The child also rides a tricylce or "Big Wheel" with good coordination and skill and will be very proud of his performance on these play toys. At meal time, spills have become a rarity. The child will know a few rhymes and perhaps even a bedtime prayer or short grace to be used in the presence of his own family. The three year old will throw overhead with his body, but not overarm yet. The child will be able to draw houses, people, and even some special shapes such as crude circles, squares, and triangles. He can match puzzles and pour from a pitcher. His balance and body control will allow him to stand on one foot, and he will be able to jump in an upward fashion. The process of dressing becomes easier, and he will even have his shoes on the proper feet most of the time. This child will be able to enumerate objects in pictures.

Age Three - Observable Behaviors

A. Child's figure straightens and flattens
B. Eats with family routine and diet, but appetite may lag
C. Dislikes bedtime - may have fears
D. Much energy, always moving
E. Disposition is difficult - fibs, name-calling, boastful, imaginative stories, and jealousy of peers and mother
F. Explores new language - repetition rhymes, play on words
G. Much verbalizing during play - may have a pretend playmate
H. Anger brings physical violence
I. Strong feeling for home
J. Very little recognition of sex differences
K. Much interest in peers, but little in adults
L. Play is cooperative, but often quarrelsome, limits needed for self discipline
M. Difficult age because of adjusting to new learning and development (Teen, 1966, pp. 41-42)

Age Four

The child of four is a typical preschooler at home or in nursery school. Some of the characteristics of the four year old will still persist when he enters his formal schooling in kindergarten.

Age Four - Physical Characteristics

The age of four is a very energetic period for the child. Most of his activities are physical in nature. He will climb, jump, run, and even do somersaults. He rides toys as fast as his legs will allow. This child is becoming a more graceful runner. He can run, turn, and stop without falling down. Some dramatic role playing will occur at this age, especially in the presence of a peer. This child, because of improved dexterity of hands and fingers, can build with blocks and use his hands independently of each other. The four year old laces his shoes and may or may not be able to tie them. Most cannot accomplish this task at this age. His throwing ability is not body oriented but is starting to be an overhand movement. His ability to climb stairs with alternating feet is improving along with speed and self-confidence. He is very much a reality-oriented child. He can

make rows of equal length but not always of equal number. (Papalia & Olds, 1975, p. 341) In terms of Piaget, the child of this chronological age is in the period of preoperational thought. The development of the child (ages two - seven) is characterized by the development of language and rapid conceptual development. (Hawkes & Pease, 1962, p. 323) Children at this age can verbalize their ideas and feelings and use their imaginations to tell stories. (Jenkins & Shacter, 1975, pp. 102-3)

Age Four - Emotional and Social Traits

The four year old begins to develop the social traits of bossing, arguing, boasting, and even fighting under some circumstances. He is definitely no longer a toddler of two or three, but is striving to fulfill a new emerging role. The child is very family and home oriented but is interested in friends of his own peer group as opposed to adults. There are also the beginning signs of friction with peers, family siblings, and adults as emotional and social development takes place. This age child can play or interact in small groups of one or two. He will become engrossed in his own single-person activity, but will gradually become more interested in playing and being with others. (Perkins, 1974, pp. 335-6) This age child exhibits an inordinate amount of interest in sexual differences, sources of babies and "dirty" jokes. (Papalia & Olds, 1975, pp. 335-6) At this age he is in the developmental stage for using large muscles and gaining body control. This child can run, jump, or even try to balance himself. He has rhythm and will engage in music oriented tasks.

Age Four - Motor and Intellectual Development

The mental development of the four year old continues to be rapid, smooth, and even. Mental coordination of motor skills become evident as the child no longer gives full attention to the motor activity but more thought to what is being accomplished than how it is done.

Age Four - Observable Behaviors

A. Legs lengthen
B. Eats in routine but without interest unless compulsive
C. Improvement of bedtime habits if no fears
D. Longer attention span
E. Disposition improves and many of last year's characteristics fade as they are not accepted
F. Sense of humor develops
G. Acceptance of limits or routines
H. Anger - attempts to hurt others
I. Pride in parents and wish to be helpful
J. Sex difference obvious in family play
K. More organized group play with less quarreling
L. More social conformation and balance
M. Self discipline is often evident
N. Interest in helping for approval
O. Left-right handed (Teen, 1966, p. 42-43)

Age Five

Age five becomes an important age for most children since this is the beginning of their formal school training. More of the children today than twenty years ago have had some form of pre-school training in either Head Start, daycare centers, or nursery schools. Ages five and six are more similar than ages six and seven. (Jenkins & Schacter, 1975, p. 116)

Age Five - Physical Characteristics

The five year old is slowing down in physical growth as compared to the first eighteen months of his life. The average child will grow two to three inches and gain only three to six pounds. Growth comes in unusual ways at this age, for legs lengthen in greater proportion than the rest of the body. Large muscles are still developing faster than smaller ones. The child sometimes is not ready for activities such as writing, since this involves holding a pencil and manipulating it to make letters. He has developed handedness by the age of five, with about 90% of the children being right handed. His hand/eye coordination is not totally coordinated. The child will occasionally spill or knock things over when trying to reach for them. Activities involving fine or close work should be avoided. (Jenkins & Schacter, 1975, p. 120)

These children are characterized as active, but are not as restless as four year olds. they have purpose to their energy and activity. They can run, dance, skip, climb, and enjoy activity - oriented games. They will explore, with limited success, jumping rope, roller skating, or ice skating. They enjoy construction with blocks and planks. Almost all of this age group can master riding two or three wheel bicycles and pulling or pushing a wagon. (Jenkins & Schacter, 1975, p. 121)

Children this age are also ready to engage in quiet activity. They will be interested in puzzles, blocks, paints, clay, and tools. Most students will take the time to see a quiet activity from beginning to end if they have seen it done before. They also like to be creative in the construction of "a something" to take home. (Jenkins & Schacter, 1975, p. 122) They are able to make a wooden stick airplane or a wooden cross or even miscellaneous size and shape sticks from wood. Sawing and nailing are favorite activities for most of the boys and for some of the girls. These children are also ready for simple principles of math, science, and technology activities or experiments. They can care for animals. (Jenkins & Schacter, 1975, p. 123) Most kindergarten children enjoy cutting, pasting and coloring, though some cannot stay inside the lines or cut on a line with a great deal of accuracy. (Perkins, 1974, p. 338) Author's note that the child of this age needs a teacher who is "a real person, one who is human, a person who is eager to share experiences and feelings-in short, one who is compassionate and mature." (Perkins, 1974, p. 342)

Age Five - Motor and Intellectual Development

The five year old now has enough knowledge in his memory that he can think about a thing without actually encountering it. He will begin to ask questions that start "What is. . . ? He will think about things not encountered by his senses and will begin to visualize them in his mind. Some children have pleasant-type dreams at this age. He may describe his dream as "a movie while he sleeps." In school, testing becomes dependable and real, and IQ approximation is more stable and realistic.

Age Five - Observable Behaviors

A. Much skill in movement
B. Disinterest in cleanliness, especially boys
C. Renewed appetite and interest in food, poor manners - fingers foods
D. Sleep habits more routine
E. Disposition again becomes difficult, stubborn, quarrelsome, and selfish unless things going his way

F. Anger-stinging words or physical violence
G. Interest in home lessens - more self-centered
H. Sex difference marked in interests
I. Identifies with adults because of school, but insecure
J. Self-discipline may regress
K. Period of great change to routines of school, home, other external forces (Teen, 1966, p. 43)

Age Six

The transition from age five to six is a monumental experience for most children. It usually accompanies the transition to full time school. The little child has become a "big boy" or "big girl."

Age Six - Physical Characteristics

The six year old's growth is less than before; however, his legs continue to lengthen and he gains both weight and height. Body types become evident. The six year old is loosing and gaining teeth. His facial features are changing shape and beginning to give him his adult-like features. Hand and eye coordination continue to improve. Large muscle skills are more smoothly executed. The fine muscle skills still need refinement. (Jenkins & Schacter, 1975, pp. 137-148)

The age six's motor activities and interests are much the same as the five year old but are executed with greater ease and skill. The previous year's uncoordinated activity is more smoothly coordinated. The student uses better judgement in throwing, catching, building, and drawing. Most students enjoy the mastery of balancing skills such as balance beams or walking on top of narrow walls and riding two wheel bikes without the training wheels. Most six year olds can keep a beat to music, jump rope, and ride a teeter totter. The six year old has assumed the responsibility for his own personal care. Nearly all children have established their handedness at this age.

Age Six - Emotional and Social Traits

The six year old begins to exhibit some of the undesirable social skills as he becomes stubborn, quarrelsome, and selfish. Some of this can be attributed to the transition from home to school. The breaking of relations with family and home are replaced by new relationships from school. Usually at this age the child also becomes more compatable with the parent of the opposite sex. The child also is beginning to define more clearly his basic personality patterns. The social relations of the child of six are uncertain. He likes to identify with adults but often is insecure and dependent. The six year can now handle group and organized team play. As the six year old becomes more a member of the community, the persons and groups within that society will have a direct influence on him.

Age Six - Motor and Intellectual Development

The six year old has an increased attention span, and the ability to concentrate has improved. He is beginning to reason more fully. He realizes the difference between fantasy and reality. Many times, this age child has an insatiate curiosity and is full of "how" and "why" questions. The six year old's language is the key to the expanding of his knowledge to increase his level of intelligence and comprehension. The questions of the six year old are relevant and meaningful, and by this time he also will be able to answer questions using fairly complete sentences.

Age Six - Observable Behaviors

A. More control in physcial activity
B. Dispostion goes from extreme quiet to extreme activity
C. Posture very straight
D. Active play for large muscles
E. Disregards cleanliness and neatness
F. Appetite begins to improve rapidly
G. Sleep pattern good
H. Less stubborn than ages 4-5
I. May have new fears
J. Sensitive to opinions of others
K. Ego centered
L. Likes group play and is more congenial than before
M. Time becomes important
N. Begins to be conscious of the need to express ability
O. More aware of personal safety
P. Father figure very important for both sexes
Q. Longer attention span
R. Like responsibility
S. Needs to verbalize ideas (Teens, 1966, pp. 43-45)

Age Seven

As one looks at the seven year old, one must remember that many six year old traits will still be present. The developmental patterns might be considered over a two year period or even a two grade period of school. Some students will complete a whole year or more of development during a single school year.

Age Seven - Physical Characteristics

Seven is one of the most active periods in the child's development. He will have to make an effort to sit still at a table. This child becomes absorbed in games which involve running, jumping, chasing, or dodging and becomes attached to "wheel" toys. The seven year old can manage dressing and shoe tying, but he is also able to dawdle away his time.

Age Seven - Emotional and Social Traits

As seven year olds, children like small group play. Boys and girls still play together. Boys will begin to wrestle and fight at this age. Many times they fight with good friends as they seek to prove their masculinity. Seven year olds like parties but their behavior is less than desirable. Their behavior alternates between "good" and "bad." They have high regard for their teachers' ideas and opinions. Seven year olds also handle the telephone with confidence and enjoy doing so.

Age Seven - Motor and Intellectual Development

Vocabulary is very important to this child and his own contains about 2500 words. He likes dramatic play and will carry on lengthy imaginary conversations. This child knows money, can distinguish between coins, and knows their buying power. He will know important facts such as his own address, father and mother's first name, and their place of employment. Most children of this age like adventure stories on television or in the movies. It is not uncommon to find some vulgar words (by adult standards) as a part of their vocabulary as well as name-calling. The child will be able to remember number combinations such as phone number, zip codes, and other unique number groups. A whole new world opens up for

this child as he begins to read in school, and it carries over to home in the form of reading newspaper comics and books like the older members of his family.

Age Seven - Observable Behaviors

A. Group games and play are accompanied by much bickering
B. Rules and regulations closely followed
C. Single friendships important but constantly changing
D. Time still important
E. Small muscle skills much improved
F. Very overt in expression
G. Enjoys school and dislikes home but continually refers to home
H. Self-discipline becomes very difficult
I. Physical changes in activities frequent
J. Sex roles more prominent
K. Disposition fluctuates from one extreme to another
L. Guttural language apparent
M. Begins collections
N. Beginning of gangs and clubs for identity and security
O. May become physically upset under tension
P. Social prejudice and attitudes develop
Q. Language may be defensive or argumentative

Age Eight

The eighth year is an eager year for most children. Their fine muscle skills are allowing them to write more evenly and to do greater manipulation-type craft skills. This is a year of interests in club memberships and in "how to do" activities. (Jenkins & Schacter, 1975, p. 165-8)

Age Eight - Physical Characteristics

The eight year old is in a period of slow regular growth in weight and height. It is the age when certain nervous habits like nail biting and scratching may develop. Most children of this age group are less impulsive and boisterous than they were at age six. Physical development encourages jumping rope and hop scotch. Jacks are popular with girls, in particular.

Age Eight - Emotional and Social Traits

The child of eight begins to show more of the influence of his peers. He becomes more interested in dressing and acting like his friends. Competition in school and at play becomes more evident. The child's choice of friends is not influenced by economic or social status. He is even increasing his awareness of others. The child of this age who becomes angry with his parents may even pretend that he is not their child. The eight year old also knows how to use money on his own.

Age Eight - Motor and Intellectual Development

The eight year old is not able to construct things as he would like to do. His results and his intention vary widely. He can grasp the concepts of addition and subtraction and some abstract mathematical concepts. He can tell time and knows what month it is. The child can run errands, make purchases, and take on other small responsibilities. This age child will often

challenge the adult as to what he is expected to do. The curiosity of the opposite sex begins to be noticed.

Age Eight - Observable Behaviors

A. Very intense in activities such as work, play or skills
B. Hands and legs coordinated
C. Small muscle skill greatly improved
D. Food habits improved but likes familiar foods. Manipulates utensils except sawing with knife.
E. Personal cleanliness and habits need direction
F. Extreme emotional shifts
G. Strong likes and dislikes for certain adults
H. Enjoys competition
I. Sensitive to correction and criticism, but critical of others
J. Projects self-image to future
K. Aware of manners but ignores them
L. Gets along better with younger children
M. Loves group activities (Teen, 1966, p. 45)

Age Nine

The typical nine year old is either in the third or fourth grade of school. The child is in the period of late childhood or early preadolescence as described by Perkins. (Perkins, 1974, pp. 302-3) Piaget put this child in the period of concrete operations. (Jenkins & Schacter, 1975, p. 320)

Age Nine - Physical Characteristics

The small or fine muscle development is evident at age nine. There is an interest in games requiring these skills such as shooting marbles, catching baseballs with one hand, and playing jacks. The student's writing has improved as his smaller muscles become more coordinated and controlled. All fine muscles skills are still difficult and tiring. The nine year old enjoys bicycling, swimming and skating.

Age Nine - Emotional and Social Traits

The nine year old is starting to exhibit signs of modesty. This is due to social pressure from peers who are experiencing different rates of physical development. Many children of this age become absorbed in group projects but do not make good members. Most nine year olds do not have trouble respecting the property rights of others. Most often, the nine year old's manners and behavior are better away from home. This child has become more selective in his choice of friends. Much of his play imitates family or school life.

Age Nine - Motor and Intellectual Development

The child of nine begins to show an interest in the past. He is interested in Indians, dinosaurs, fairy tales, or "what it was like in the olden days." The nine year old knows the days of the month and the year. He can also make change for money. This child will regularly read the comic strips in the paper and selected short articles. His taste in types of television, records and radio show reflects his changing interests. The nine year old also exhibits a sense of humor. The child is expanding his experience with interest in the world at large, especially far-away places. This age student will maintain an active pen-pal relationship with another child in a foreign country.

The child in his ninth year may often become a perfectionist. Jenkins and Shacter describe the nine year old as follows:

> Nine year olds are becoming more skillful with their hands; their eye-hand coordination is greatly improved. Individual differences in coordination are increasingly apparent. Both boys and girls enjoy crafts and shop work and some can carry out many kinds of careful, well-planned craft work. Others, however, still have trouble with handwork that requires any great degree of skills. (Jenkins & Shacter, 1975, p. 179)

This age child is interested to know about different parts of the country and different occupations. He is interested in the tools and the skills, the products, and the jobs of the real world. (Jenkins & Shacter, 1975, p. 182)

Age Nine - Observable Behaviors

A. Boys' physical development two years behind girls'
B. Sudden growth in height and/or weight may occur awkwardly
C. Need for food and sleep increases
D. Very conscious of physical size
E. Need sense of acceptance
F. Gossipy and secretive
G. Interested in sex information
H. Hero worship
I. Likes activities
J. Interest in school to do best
K. Overanxious - may eat to relieve tension
L. Conscious of physical development and changes to come
M. Awkward
N. Doesn't know when tired
O. Picks out own clothes like others, but nothing different
P. Needs reassurance for growth and development to give them a sense of belonging and security (Teen, 1966, pp. 45-6)

Age Ten

The child of ten is beginning to approach the world of the adult. It is usually a very profitable year in terms of teaching and learning.

Many child psychologists think of the ten year old as being on a plateau since it is after the formative childhood years and on the threshold of the adolescence. This age is one of the places in development where boys andgirls are nearly equal. From this point onward the girl will develop faster than the boy and remain there for several years. This age is also one of not only great physiological but also psychological change. The period from age ten to twelve is one of immaturity and dependence.

The child of ten to twelve is also beginning to think about exploring his vocational interests. (Jenkins & Shacter, 1975, pp. 191-207) Most ten, eleven and twelve year olds are enrolled in the fifth and sixth grades of school.

Age Ten - Physical Characteristics

The ten year old has slowed in physical growth, particularly in height. This child starts to be concerned about his own physical appearance. He may change clothes several times a day, take more baths than usual, and spend additional time combing hair and grooming. Most

ten year olds will need more sleep and rest than they get. They always seem to be on the "go" with sometimes more than one activity. They are interested in all types of play. They are also disdainful of danger and sometimes get into plenty of it.

Age Ten - Emotional and Social Traits

Age ten is perhaps the dividing line between coeducational play activity and sex-dominated play. An antagonism usually develops between the sexes. It will last for several years. Boys usually persist longer than girls. Many students, at this age, start lifetime hobbies, collections, or other avocational interests. They work well in groups and enjoy clubs. The enthusiasm for club and cliche activity is very noticeable. They possess and exhibit hostility toward other similar groups. Many clubs have unusual unique characteristics and most are short-lived. The ten year old is ready to visit away from home and may enjoy going away to camp for several weeks during the summer time.

Some children exhibit reticences and hostility toward adults. Most children possesss secrets at this age. They will begin to be able to admit mistakes and seek to correct them. They are eager to learn new skills and enjoy working with an adult in almost any type of task from physically hard labor to fun activity. This age is the proper time for an allowance.

Age Ten - Motor and Intellectual Development

With age ten comes the mental ability to handle the multiplication and division processes. Boys and girls, at this age, begin to exhibit different interests in their reading materials. The advanced child will be reading full length books. The child's friendship circle will extend outside the immmediate neighborhood. His interest in radio and television programs will continue to broaden. Both sexes will show interest in where they come from and how. They are likewise interested in how other things are made. They show more interest in the many things are made. They show more interest in the many things around them. At this age, special interests, like science, dolls, a collection, or piano lessons will begin to crowd out play activities.

Age Ten - Observable Behaviors

A. Very messy in personal habits
B. Rapid growth causes restlessness
C. Aggressive and competitive
D. Argumentative with outbursts of anger
E. Cries often and jealous of other children
F. Need and like routine
G. High standards and conscience
H. Very interested in science, adventure, and exploring
I. Girls begin to develop breasts and may like romantic TV programs or movies
J. Much use of telephone
K. Collections
L. Likes parties but one sex
M. hates to be alone
N. Individual differences pronounced
O. Likes "corny" jokes
P. Girls like a "best" friend, but may change often (Teen, 1966, p. 46)

Age Eleven

The eleven year olds are beginning to develop noticeablely into their respective sex types. This is a big change for either sex.

Age Eleven - Physical Characteristics

The eleven year old girls, in particular, will show a rapid increase in weight as they mature toward womanhood. Boys at this time are more rough and active in their play activities than the girls. Both are willing to work hard at acquiring new and more sophisticated physical skills.

Age Eleven - Emotional and Social Traits

What seems like a great change occurs at age eleven. Competitive and organized games become more prominent. Both sexes will play games with teamwork and strict adherence to the established rules. Privacy becomes an issue at this age. Many children may ask for separate rooms and be very disturbed if parents or siblings violate their private domains. Secret places become a need as the child seeks to keep some thouhgts and/or objects strictly to [illegible]

Age Eleven - Motor and Intellectual Development

At age eleven, the child begins to plan ahead. The student is able to discuss problems and see both sides of questions. He is interested in the thoughts and ideas of others, and the ability to think and reason continues to increase. With this mental maturity, he becomes a more creative companion for parents and other adults.

Boys, particularly, enjoy gathering facts to present a case for or against a point or just to "find out" about something. Many children can handle simple fractions.

Age Eleven - Observable Behaviors

A. Restless, awkward, and self-conscious
B. Motor skills difficult
C. Need for physical action tapers off
D. Tires easily - eats well
E. Hates or loves
F. Jealousy tapers off
G. Adults infulence but confuse him
H. More tolerant of family
I. Calms down and organizes himself better
J. Curious about his feelings and wants to compare them to others
K. Attention span good if on his favorite subject
L. Great difference between boys and girls in physical development and interest
M. Girls have more friends than boys
N. More quarreling but less physical fighting
O. Enjoys games with others rather than playing alone (Teen, 1966, p. 47)

Age Twelve

The twelve year old is in the period of early adolescence according to Meek (Perkins, 1974, pp. 302-3) or in the early year of formal operation as proposed by Piaget. (Jenkins & Shacter, 1975, 1975, p. 320)

Age Twelve - Physical Characteristics

Many girls by the age of twelve, are no longer equal in physical strength or endurance as compared to boys of equal size. Most children at this age begin to exhibit individual preference for different games and motor skills.

Age Twelve - Emotional and Social Traits

Clubs and memberships begin to take on new importance and meaning. The twelve year old is interested in taking part in school, neighborhood, and community affairs. Team games become an important part of this child's social life. If shyness is present in a child, it will show itself at this age.

Age Twelve - Motor and Intellectual Development

The twelve year old begins to be critical of his own efforts. He is interested in earning money above and beyond his allowance. Most of the money earned will be spent on hobby materials and other things for collections and the like. Girls more so than boys, will be interested in their role in reproduction. They are also very interested in the use of public facilities and other feminine concerns.

Age Twelve - Observable Behaviors

A. Need eight hours rest, but unwilling to slow up
B. Appetite either enormous or fair
C. Body growth varies
D. Fads
E. Group status important
F. Problems with understanding
G. Wants to identify with adults admired by them
H. Telephone always tied up
I. Likes opposite sex but embarrassed by it (Teen, 1966, p. 47)

Age Thirteen

Age thirteen is the beginning of the end of early adolescence. The gap between boys and girls has widened in the physical, emotional and social stages of development. Mental and intellectual development is nearly even among the sexes.

Age Thirteen - Physical Characteristics

The child of this age will not be involved with games which require whole body activity as he was at age ten. At this time, muscles represent between 40 and 50 percent of a person's weight. Many children show a self-consciousness about learning new physical skills because they have become aware of differences in abilities of members of similar size and maturity. Some children exhibit an awkwardness. Most girls are aware of their developing figures as are developing boys. Most thirteen year olds will lean toward spectator sports chosen by individual preference.

Age Thirteen - Emotional and Social Traits

The thirteen year old's social contacts are constantly widening with a noticeable independence in the choice of friends. If the social enviornment is not healthy, the beginnings of juvenile delinquency may occur. As the individual child approaches puberty, there will be periods of time when he will want to be alone. Boys will admire boys who are more skilful, bold or daring. Girls find it more acceptable to conform and to be feminine.

Age Thirteen - Motor and Intellectual Development

The ability to reason continues to sharpen and become more adult-like. The child or young adult can handle decimals and even abstract ideas such as justice, etc. The thirteen year old can control his emotional outburst and even postpone satisfactions. Friends are now selected by similarity of interest, mental age, and physical development. Students begin to indicate an interest in their culture and their part in it. Moral and religious codes or interests come to the forefront at this age. This a particulary hard time for parents and teachers for they must have a sympathetic understanding of the child so that he has a period of successful adjustment to adulthood from adolescence.

Age Thirteen - Observable Behavior

A. Adolescence begins - girls two years ahead of boys
B. Adult appearance apparent
C. Need rest as adult
D. Enjoy skill games
E. "Puppy" love
F. Egocentric - many worries about self
G. Wants freedom from home
H. Needs to be popular
I. Future becomes important
J. Controls outbursts
K. Argumentative - very verbal
L. More mature behavior and thinking
M. Preoccupied with clothes and appearance (Teen, 1966, p. 48)

If teachers of a particular age child would look at the expected behaviors of that age group, they might put specific educational experiences into their program to meet those behaviors. The following several pages might serve as a model to suggest how this could be done, using age five as an example. Most of the experiences have implications for industrial arts but are presented in typical kindergarten activities. This expected behaviors/provision chart comes in the modified form from the Team Tutorial Program developed by the Southwestern City Schools of Grove City, Ohio, under a federal grant.

Additional Theories of Development by age groups is best summarized in Jenkins & Shacter (1975) on pages 316-365.

EXPECTED BEHAVIOR/PROVISION CHART

Five Year Old Behaviors	Kindergarten Provisions
1. Children are growing rapidly and are extremely active physically.	1. Room is allowed for them to play freely and use their muscles through activities such as building blocks, jungle gym and riding toys.
2. They tire easily.	2. Rest and quiet time are part of their schedule. They are alternated with active play periods.

3. They have better large muscle control than small muscle.	3. The child will work with large objects such as big blocks, fat paint brushes, large crayons and pencils and riding toys.
4. They have developed a dominant handedness.	4. Proper scissors are supplied the child, his writing instructions match his chosen handedness. Change should never be attempted.
5. They have a short attention span.	5. Many interest centers (art, block, tools, science corner, and books) are available for the children's use. Involvement will develop and lengthen the child's attention span.
6. The child enjoys books and stories.	6. The child has the opportunity to look at and read many books. These include books about animals, people fantasy, community helpers, colors, numbers, poetry, and fairy tales. The child has a chance to talk about books, make up plays or to draw pictures of the story.
7. The child is imaginative.	7. The child is encouraged to make up stories and poems. They are often recorded for him.
8. The child experiments with communications.	8. Play telephones are available to use to call his real and imaginary friends. He may let older persons write notes or letters to accompany his pictures.
9. They begin to play in larger groups.	9. Large group games are part of organized play. Small groups of three or four will work or play together with blocks or art. The child will have a new variety of activities which involve more children.
10. The child is interested in the world in which he lives.	10. The kindergarten offers him a great deal of information through books, films, walks in the school neighborhood for looking, listening, smelling, tasting, and touching things around him. He will share discoveries with others in interest centers.

11. They are expected to live up to the expectations of the adults around them.	11. Directions from the kindergarten teacher are generally attempted. The child needs frequent encouragement and should be praised often for both attempts and successes.
12. The child develops a sense of time.	12. The school program is generally scheduled for work, play, snacks, and library. Most activities are scheduled the same everyday to help him relate to a specific time of the day.
13. The child is interested in the world of nature and science.	13. The child is exposed to watching fish or a pet. Nature walks are taken to look at plants and animals. Magnets, magnifying glasses, and other science related materials should be available. Collections are part of a science corner.
14. The child is curious. He wants to know how and why.	14. The teacher does not simply answer questions, but helps to discover the answer by looking, thinking, or experimenting.
15. The child enjoys musical and rhythmic instruments.	15. Rhythmic games, songs, and dances are included in the activity portion of the school day. (Teen, 1966, pp. II - 2-5)

ROLE OF INDUSTRIAL ARTS ACTIVITY AS A PART OF THE ELEMENTARY SCHOOL CURRICULUM

Activity is a term that can be used to describe all types of work, play, exercises, or experiences which happen within the elementary school. Elementary school educators say that the practice of writing letters and numerals with a large pencil in kindergarten or first grade is activity. The construction of rhythm sticks can be viewed as a musical experience or an industrial arts activity. By the same rationale, the elementary age student engages in a great number of activities in the name of art, science, math, social studies, physical education, industrial arts, music, and even career education. Some of these activities may be called exercises, play, or work. The opposite of activity is sleep or rest. Activity involves cognitive, affective and psychomotor domain skills.

A large portion of the learning which takes place in the elementary school is a result of activity. Activity, as defined in this monograph, uniquely helps the elementary school and its curriculum to develop the full potential of the student. Activity encourages initiative and imagination. Acitivity allows the student to do what he wants or needs to do on an individual basis. Many activities are parts of a period of experimentation in the life of the school age child. Many children, without knowing, will use activity to release their feelings, even anger. Activity allows the child the opportunity to relate to the world around himself in a direct, firsthand manner. (Jenkins & Shacter, 1975, pp. 96-97)

Various activities at different ages tend to foster various stages or levels of development. For example, the five or six year old's activity should encourage or strengthen the large muscles of the body. As new skills become part of the students' repertoire, old earlier skills will become less rough, spasmodic or jerky. (Jenkins & Shacter, 1975, p. 141) By the time this child is nine, skills in particular will start to separate the competitors, from the non-competitors. (Jenkins & Shacter, 1977, p. 181)

Breckenridge writes regarding the balance between rest and activity. She points out:

> Both activity and rest are important because of their relation to nutrition and growth. Muscle activity is important in that it improves circulation, respiration, stimulates appetite, aids digestion, improves muscle tone thereby fostering good posture and normal elimination, lessens tensions, and increase endurance, strength and accuracy. The amount and kind of activity satisfactory for a child depends upon his bodily strengths and weakness, his general physical health, and his stage of development. (Breckenridge & Vincent, 1965, p. 129)

She goes on to say that four to five hours of activity should be part of the typical school day. The teacher must bear in mind that periods of inactivity or change of pace are necessary periodically to restore muscles. Students must learn how to rest. Rest may come in the form of physical, emotional, and mental inactivity. Different children require differing amounts of emotional and mental rest while requiring greater physical activity. (Breckenridge & Vincent, 1965, p. 129)

Industrial Arts activity comes in many forms in the elementary school curriculum. Industrial arts is a method of instruction as well as a content area in its own right. Most often, industrial arts is used as a sup-

plement to the existing subject content of the elementary school. It is industrial arts activity which builds the blocks for the pyramid as part of the social studies unit on Egypt. Is it the mathematics or the industrial arts which measures the blocks? Most of the books mentioned in the first part of this monograph have many pages devoted to suggested activities that can be correlated to the other elementary school subject areas.

In order to understand the contributions of elementary school industrial arts to the student's growth and development one must review the current literature. William R. Hoots, Jr. (1968) made this review in his research report entitled: **The Development of A Course of Study for Industrial Arts Education at the Elementary School Level.** Hoots reviewed the literature of that decade in search of the same question.

A review of many articles mentioned in the Hoots' study helps to delimit and define the role of industrial arts at the elementary school level. The following will give the reader a feel for the contemporary thought.

> This purpose (objective of elementary school education) to orient the school program in the world of work. . .is based on the hypothesis that the world of work can be used effectively as a framework to unite and direct eduational efforts. It stems from the belief that unless the school program accurately reflects work as a part of our culture, it cannot purport to transmit our culture. Without this orientation boys and girls cannot intelligently select and pursue a program of studies that will permit the development of their maximum potential. Consequently, occupations in industry—the world of work— should be recognizable influence in the content and structure of the entire school program. (Hackett, 1966, p. 61)

> . . .there is evidence that the apparently aimless search for suitable elementary school activites has been given direction and purpose by changes in our economy, our society, and professional education which belatedly indicate that some of these activities should be industrially oriented, provided in every elementary classroom and related to the total elementary program. Professional direction is still lacking, but the growing need will doubtless force activity on many fronts. Perhaps the work by Comenius, Locke, Rousseau, Pestalozzi, Bonser, and Russel will culminate in a dymanic type of activity program suitable to the needs of modern youth. Perhaps we are finally approaching the time when the nature, scope, and purpose of elementary school activities will be concisely defined and generally accepted. (Scobey, 1966, p.24)

Industrial arts at the elementary school level is not another subject to be added to an already crowded curriculum; it should be an integral part of the already established curriculum — an enrichment to that which we now have. This is amplified by Dr. Carl Gerbracht and Dr. Harold Gilbert when they say that its ". . .purpose is to assist in the achievement of the generally accepted goals of elementary education." (Hoots, 1968, p. 10) Walter R. Williams, III, in his article "Studying Industry in the Grades," agrees when he makes the following statement:

> Elementary school industrial arts must be concerned with modern day technology, because the main goal of elementary school industrial arts is to reinforce and supplement the elementary curriculum.

> If elementary school industrial arts is to contribute to its fullest extent in the development of American youth, it must be concerned with helping students develop an understanding of present-day society of which he is to be so intimately a part. (Williams, 1965, p. 54)

Dr. Robert G. Thrower further supported the postion that industrial arts should be a part of the elementary school curriculum in an address to the 1967 American Industrial Arts Convention:

> . . .technology and its implementation through industrial arts activities should be integrated into the very core of the curriculum of every grade level beginning with kindergarten. Elementary classroom teachers must be trained in the use of tools and materials of industry. They must also be trained in the methods of utilizing industrial arts activities. Industrial Arts specialists must be trained and employed by elementary school systems, and the necessary tools, materials, and working areas must be provided. (Thrower, 1967, p. 198)

The literature clearly indicates that industrial arts, as study of technology and its effects on our society, needs to be studied at all levels of education. Industrial arts experiences should first begin in the earliest form of child's educaiton and should be continued throughout his formal education in order to help him orient himself to the world in which he must live. To this point, contributors to the literature are in agreement. However, the nature of industrial arts at the elementary school level is not clearly defined in the literature. Some think of it as a method of teaching—a manipulative method—appropriate for any subject in the elementary curriculum. Others look at industrial arts at this level as an arts and crafts within itself that should be either correlated or integrated with other phases of the curriculum. (Hoots, 1968, p. 11)

There is very little reference in current industrial arts literature to handicraft programs; however, when industrial arts is mentioned to a group of teachers or parents, the first thing that comes into their mind is something in the nature of handicrafts. One writer, Robert Babcock, when listing some of the things that children do in an industrial arts program, says,

> . . .In some programs children construct items that are of particular interest to them (or to their teachers). Toys, games, gifts, and other "useful" objects are constructed. Sometimes there is a flavor of the arts and crafts approach here with emphasis on manipulation and experimentation with the media. Usually, a part of this type of program includes basketry, boondoggling (working with lacing materials), clay work, weaving, and other "crafty" experiences. All children have identical experiences, and there is usually little, if any, relationship to the work of the general curriculum. (Babcock, 1964, p. 138)

The majority of writers in the field of elementary industrial arts seem to feel that it should be some kind of an integrated program in which industrial arts emphasizes the technological aspects of the school curriculum, promotes interest and motivation to facilitate better learning in the other areas of the curriculum, and provides a manipulative method in which the children are actively involved in the process of learning other subjects in the elementary school curriculum, such as science, math, or social studies. To the extent that industrial arts improves learning in other

subject matter areas, these proponents of an integrated curriulum see industrial arts as contributing as much to teaching method as to the subject matter area.

> At the present, most elementary programs involve a study of the cultural heritage, including many of its industrial aspects. Indeed, it is difficult to imagine teaching social studies without reference to the arts of industry which have played so vital a role in establishing our social order. But it should be noted that this is often attempted without providing any manipulative experiences with tools and materials. The story of our people engaged in mining, lumbering, power production, construction, manufacturing, transportation, communication, and other industrial pursuits can be told with words alone, but to do so denies the greatest lesson of modern psychology. How much more likely our pupils are to appreciate the significance of industry when their own hands perform many of the same tasks! (Gerbracht & Gilbert, 1958, p. 199)

> Industrial arts, as a term which indicates a study of the tools, materials, processes, and products of industry, is inadequate in describing the role of "construction activity" in elementary education. Industrial arts must lose its identity as a subject matter filed it it is to make its greatest contribution as a means of implementing the generally accepted goals of the elementary school program. The focus of attention is not to be placed upon the study of tools, materials, and processes of industry, but rather should be concerned with the bringing of increased meaning and understanding to units of instruction through group or individual "constructional activities." (Miller, 1962, p. 21)

> This proposal to orient the school program in the world of work while neither new or novel, is based on the hypothesis that the world of work can be used effectively as the framework to unite and direct educational efforts. It stems from a belief that unless the school program accurately reflects work as a part of our culture, it cannot purport or transmit our culture. Without this orientation, boys and girls cannot intelligently select or pursue a program of studies that will permit the development of their maximum potential. Consequently, occupations in industry—the world of work—should be a recognizable influence in the content and structure of the entire school program. (Hackett, 1966, p. 61)

> Working with construction materials and using tools and processes, the clever teacher can cultivate interest in a study of these basic needs and extract some performance from the child to promote reading, writing, speaking, and other regular subjects. . .Each of these items suggests some investigative reading, maybe a written or oral report. Geographic locations or sections of the country where such industries prevail can be pointed out on maps and some insight can be given into the lives of the people who work and make these materials possible. . .This kind of approach and interpretation does not rule out other intrinsic values of the constructional ac-

tivities—consumer information, appreciation, and acquiring skills with tools. Manipulative skills are somewhat incidental at this stage and secondary in importance. . . (Duncan, 1963, p. 19)

All of the preceding references advocate the integration of industrial arts as a part of the total elementary school curriculum. The opposing view can be found in current literature.

> Industrial arts is a study of production, consumption, and recreation in a technological society. This study can be started in the kindergarten and carried on in the classroom through out the elementary school grades. (Gilbert, 1966, p. 1)

> The modern concept of teaching in the elementary school relies heavily upon the unit approach. This approach crosses traditional subject lines and unifies them into an integrated unit of learning. Industrial arts can be either brought into a unit to aid the correlation of subjects or it may be a basis of the unit with which other subjects are integrated. . . (Thrower, 1967, p. 198)

Hoots drew the following conclusions about elementary industrial arts in 1968.

> (1) That industrial arts is a subject matter discipline to be studied in the elementary grades, and it deals with the technological aspects of our environment and its effects on daily living.
>
> (2) That all preparation of living in our contemporary society is related and consequently, all learning should be related at the elementary school level. This, then, indicates that industrial arts—the study of technology—should be related to all units within the curriculum.
>
> (3) That the teaching of elementary industrial arts should be a conscious effort to identify the elements of industry in units of study in the various curriculum areas of the elementary school programs and to make a positive attempt to teach children about these facets of our technological society.
>
> (4) That industrial arts at the elementary school is appropriately taught when integrated with other subjects, within units of study or when it is taught separately but correlated with other subjects being studied. (Hoots, 1968, p. 14)

Since the Hoots Study of 1968, the literature in the elementary school industrial arts field has attempted to speak to the question of the role industrial arts activities in the elementary grades.

D.C. Hoffman (1970) speaking at a ACESIA General Session at AIAA Convention in Louisville, Kentucky, explained the role of industrial arts as in McDonald Elementary, Warmyster, Pa.

> The Industrial Arts Center is considered a laboratory where students are given an opportunity to explore and experiment with the technological and esthetic aspects of their experiences in the clasroom. An area in the elementary school where individuals and groups of students can engage in three-dimensional problem solving and creative expression. . .The interrelationship among the various materials, processes and crafts in every phase of industrial production can be adapted to the

endeavors of the elementary school student. We view education as different from skill acquisition: It should be dedicated to skill using, ultimately interrelating the higher levels of the cognitive, affective and psycho-motor domains. Toward this end the industrial arts program is a meaningful component in the elementary curriculum. (Hoffman, 1970, p. 41)

Hoffman goes on to explain the ways in which he believes industrial arts helps the learning process. His theory revolves around an Elementary Industrial Arts Center.

> Children learn in a variety of ways. The Elementary Industrial Arts Center provides an additional learning environment for the learner to practice and integrate his knowledge toward personally unique and tangible goals. (Hoffman, 1970, p. 41)

At the 1970 conference of AIAA in Louisville, Kentucky, the ACESIA lead a sub-committee report on "A Basis for Elementary School Industrial Arts" as part of the National Conference on Elementary School Industrial Arts. This report was presented by Thomas J. Jeffrey on behalf of the five person committee. Because of the unique nature of this report, it is reproduced in its entirety in this document.

> The development of a basis for elementary school industrial arts requires the formulation of a definition and a statement of philosophy. These serve as a foundation upon which communication components can be developed and which should form the basis for selecting instructional activities.
>
> Definition of elementary school industrial arts. Industrial arts at the elementary school level is an essential part of the education of every child. It deals with ways in which man thinks about and applies scientific theory and principles to change his physical environment to meet his esthetic and utilitarian needs. It provides opportunities for developing concepts as a result of concrete experiences which include manipulation of materials, tools, and processes, and other methods of discovery. It includes knowledge about technology and its processes, personal development of psycho-motor skills, and attitudes and understandings of how technology influences society.
>
> **Philosophical bases.** Public schools in the United States are committed to a general education developing the full potential of all children. School systems differ widely in their approach to the child, the environment and learning experiences. There is a divergence from highly structured to non-structured programs. For the most part, learning has been oriented to the verbal and symbolic; provisions for developing the non-verbal abilities of each child have not been emphasized.
>
> Each child brings to the learning situation a unique profile of development resulting from the sum total of his past experiences. Therefore educators must recognize and deal with individual levels of development in such personal characteristics as attitudes, values, self-concept, knowledge and psycho-motor skills.

Recognizing these individual differences, there are two fundamental dimensions in which the educational process operates and for which the educator must assume responsibility. The first is the physical setting, which includes materials, facilities and media stiumulating both verbal and non-verbal responses in the learner. The second is the mode of the organization, governing the ways in which the child operates in the physical setting. a flexible learning situation sets the stage for interaction, exploration, experimentation, problem solving and concrete experiences that satisfy aesthetic and utilitarian needs. Learners are provided opportunities to assume responsibiltiy, make decisions, think, receive immediate feedback and express themselves freely.

Industrial arts for elementary school can satisfy these conditions. The uniqueness of industrial arts lies in the fact that its activities can provide a greater variety of elements that enhance the learning process than any other single discipline.

Concrete experiences. the major emphasis is upon concrete experiences which deal manipulation of and exploration with materials, tools and processes. While processing the change of materials (from raw to contrived) and fabrication objects, the child is involved in the physical and sensory interaction with things. Through first-hand experience, he learns the characteristics, potential and limitations of materials, and their cultural functions.

Thought processes. The thinking process, unique to technology, involves problem-solving based upon the manipulation of materials The more frequently children experience problem-solving situations, the more fluent becomes their thought processes and the more easily they can make new associations. They are increasing their abilities to interact through the language of forms. They are building ideas from technological production and the social influences of technology. They are learning to live effectively in a technological culture.

Learning processes. Through industrial arts experiences, learning may be come relevant, lasting and both individually- and socially-oriented. The optimum learning situation provides: sensory data input through all sensory channels, immediate feedback, opportunity to think in a problem-solving way, opportunity to try out ideas and test them against reality through other than verbal tests, and opportunity to nurture creativity.

Personal abilities. The dynamic industrial arts program will foster the development of the following personal abilities: to think concretely or to lessen degrees of abstraction; to act with autonomy and self-direction; to solve each problem as it occurs; to make judgements; to increase control of the total body to perform tasks; to be increasingly creative and to perform creative operations at higher levels or degrees; and to develop organizational ability through more sophisticated levels.

When one makes decisions to change materials, one must make

organizational commitments. One must preorganize actions which are different when dealing with concrete objects rather than with verbal symbols.

Self-concept. An increasingly positive self-concept can be developed when children find success in the manipulation of materials. The planning, production and completion which translate a visual image into concrete form provide multiple satisfactions. The drive to mastery of something outside of the self is satisfied; desire for competency is innate within us all. One may take pride in individual accomplishment, in recognition from others and the resulting extension of self.

World of Work. Understanding of industrial processes and insights into manufacture and productions, as well as exposure to and contact with the physical and mental world, facilitate orientation to the world of work. Students attain respect for craftsmanship. They learn to appreciate ability in others, both in technical skills and talents other than manipulation. These appreciations enhance human relationships. They help individuals recognize their own place as contributors to the social system, and the accompanying sense of accomplishment and involvement. (Jeffrey, et al., 1970, pp. 51-52)

Another committee report delivered at this same cited conference outlined the nine essential componenets of effective teacher education for elementary school industrial arts. The nine components were: 1) philosophical; 2) tool and materials exposure; 3) technological content; 4) environment for learning; 5) opportunity to apply learnings with children; 6) involvement of resource person; 7) involvement of community resources, physical and human; 8) techniques for gaining administrative involvement and 9) program evaluation. (Throwers, 1970, p. 53) All of these components indicate the nature of the national direction at that place in time.

William R. Hoots, Jr. (1971) at AIAA Conference served as the moderator of a panel of experts in the field of elementary school industrial arts who spoke to four major questions regarding that field. Three of the four questions are pertinent to this monograph. The first question was preceded by Moderator Hoots reading the elementary school industrial definition as established by the National Conference.

> Industrial arts at the elementary school level is an essential part of the education of every child. It deals with ways in which man thinks about and applies scientific theory and principles to change his physical environment to meet his aesthetic and utilitarian needs. It provides opportunities for developing concepts through concrete experiences which include the manipulation of materials, tools, and processes, and other methods of discovery. It includes knowledge about technology and its processes, personal development of psycho-motor skills, and attitudes and understandings of how technology influences society. (Hoots, et al., pp. 74-75)

The first of the three relevant questions to be discussed was: "What is the nature of industrial arts at the elementary school level?" All three

questions were answered respectively by Dr. Margaret-Mary Scobey, Mrs. Norma Heasley, and Dr. William A. Downs. Dr. Scobey's reply was as follows:

> . . .industrial arts is a discrete discipline. . . .it encompasses a body of knowledge, skills, attitudes and activities related to man's way of changing raw materials for the increasingly sophisticated needs of daily life. Industrial arts seeks interpretation of industry and technology on the cognitive, affective and psycho-motor skills learnings related to technological products, the work-world related to them and their influences on society.
>
> Industrial arts experiences are not project activities alone. The concrete activities in industrial arts that help children discover the complexities of technology must be a part of the network of experiences that will help learners draw thoughtful conclusion and modify attitudes, as well as develop skills in using tools and materials. Just to make a tie rack or to mold plastic is not enough, nor should building an electric motor be an end in itself. The learner needs to know why that motor works and what influence that working motor has on our way of life. And perhaps he also needs to know the difference between a motor and an engine.
>
> . . .industrial arts includes both training and education. The replicative and applicative aspects of training (learning to be used in predictable situations) are reflected in skills such as using tools and materials. The associative and interpretative learnings, or education (used in unpredictable situation), are found in knowledge about the world of work, ways and means by which materials and products are obtained and prepared, and the changes produced by them in the pattern of life. (Hoots, et al., p. 75)

Mrs. Heasley's response to the same question was as follows:

> . . .industrial arts at the elementary level as a subject that involves activities designed to help children understand people and the world in which they live. It involves the study of man and his technology in industries, businesses, services, and recreations.
>
> As the child is involved in thinking, investigating, planning, and evaluating for project construction, he is also developing basic academic skills in reading, English, math, social studies, and science. Yet, as he constructs the project, he is developing personal skills that help him to deal with and adjust to his environment and life situations. (Hoots, et al., p. 75)

Dr. William Downs saw the question from the point of view of the learning theorists:

> . . .Learning theorists tell us that for effective learning to take place, the learner (a child in this case) must respond physically, intellectually, and emotionally as a total person to a whole situation. In other words, the learner must experience; he must interact with the world in which he lives; he cannot remain inactive. Effective learning takes place when the program is flexible and provides a variety of experiences which are, in part,

physical in order that the child's basic needs are met and that he will approach the learning task with interest and enthusiasm. This is the point at which industrial arts comes into play at the elementary level.

. . .think of industrial arts at the elementary school level as a vehicle by which or through which the classroom teacher can provide a wider variety of learning experiences for children than are normally provided for children in the traditional elemetary school program. In order to satisfy the aesthetic and utilitarian needs of children, their experiences should involve opportunities for interaction, exploration, planning, construction, experimentation, and problem-solving to mention but a few. Properly selected industrial arts activities provide such opportunities for the learner as well as providing the learner an opportunity to assume responsibility, to make decisions, to think and express himself freely and creatively, and to receive immediate feedback. I see this not as a crafts approach designed for only aesthetic and leisure time pursuits, but as an approach by which children are given an opportunity to develop a deeper understanding of our industrial technological society. (Hoots, et al., 1971, pp. 75-6)

The second significant question to be spoken to by Dr. Scobey, Mrs. Heasley, and Dr. Downs was "What is the relationship of industrial arts to the total elementary school curriculum?" Dr. Downs response was:

Years ago, when the work of the world was in the home, on the farm, or in the village, children were afforded many opportunities to learn how the basic needs of life were met. This is no longer the case in our complex industrial/technological society of the 70's. There is little opportunity for the direct observation of the world of work by children. Yet, there is a definite need for children to understand the complex life of which they are a part and how it came to be if they are to develop the knowledge, attitudes, and appreciations essential to the steady progress of civilization.

Based on the changes in our societal structure, there are educators who would advocate that industrial/technological experiences should form the foundation of the elementary school curriculum. I cannot accept that position, even though I realize that well over 50% of the nation's labor force is engaged in occupations.

Another group of educators advocate industrial arts as a vehicle for imparting occupational information. I feel that industrial arts can make its greatest contribution when used in supportive function for implementing more effectively the existing content of the elementary school curriculum. The enriching experiences that are inherent in this latter approach will more than provide a sound context wherein children may experience, directly and indirectly, a wide spectrum of the world of work.

I feel that the complexity of our world makes it imperative that children experience a large segment of our technology.

The unit approach to curricular organization is used by most of today's elementary school teachers and serves as an excellent vehicle to convey this kind of information. Industrial arts experiences are well adapted to this scheme of curricular organization, and though this integration of industrial technological content with the existing curriucular unit (through information and activity), the child is afforded a much better opportunity to learn how an idea eventually becomes a product. (Hoots, et al. 1971, p. 76)

Dr. Scobey spoke in terms of the interdiciplinary part of the elementary school curriculum:

That is, the concept of industrial arts is developed through integration with other disciplines. This is necessary to make the most economical use of teaching-learning time and to help the learner discover the relationships between industry technology and other areas of life. The tendency to break down disciplinary lines in the elementary school is already established.

There are three interdisciplinary aspects of industrial arts. First, the academic content of industry technology is related to many subjects. For example, physics, design, advertising, and geology are some of the areas from which knowledge is needed to develop industrial technical processes and products. Therefore, few industrial arts activities can be separated from content in other disciplines. Second, the method of teaching industrial arts, its activities, extend and support skills, attitudes, and ideas learned in other curriculum areas. For example, we well know the need for measurement and other mathematical computations in construction. To solve problems and organize information in industrial arts, students must use language skills such as research and reporting. Thirdly, the skills learned in industrial arts can be used to produce instructional aids that will make learning more interesting and productive for other disciplines. Examples of these are the abacus, pocket chart, and the electric circuit board.

. . .that the interdisciplinary character of industrial arts can best be utilized within the context of a unit of study. The focus for such a unit may come from any one of several disciplines, with content and activities from industrial arts integrated within it. (Hoots, et al., 1971, pp. 76-77)

Mrs. Heasley approached this question in terms of a body of knowledge:

. . .industrial arts should be an integral part of the total elementary school curriculum. Any analysis of a science book shows many experiences which gain value when involvement with tools and materials develop the experiment. Acting, discussing, and analyzing how this experience is useful to man gives meaning to an otherwise isolated activity.

The body of knowledge becomes important when it is analyzed from the point of its effect on man's life. Therefore, children should be guided in critical thinking and planning, using the design that seems to be man's involvement with technological

developments. That is: 1) recoginize a problem, 2) collect, organize, and analyze data, 3) develop an hypothesis for solution, 4) execute this idea by planning and researching and test the idea by experimenting, constructing, demonstrating and evaluating, 5) put the idea to work, 6) re-evaluate the result, and 7) use the product for man's benefit until another problem arises. Through this involvement, children can gain understanding of changing raw materials to finished products and interpret technology in all phases of man's work and life.

. . .every culture is and has been affected by technology and its implications. How man develops and uses his tools, machines, and materials and how this affects him is social studies.

When a child develops an idea, searches references, designs a plan, gets involved in research, experiments, constructs, demonstrates, and evaluates his work, he is making decisions that give dimension to abstraction. This is true at all levels of learning. This may include industrial arts experiences. This involves the development of reading, writing, researching, analyzing, and problem-solving skills.

Cost analysis involves the use of math skills. Measurement experiences using a variety of tools and materials strengthen math skills. (Hoots, et al., 1971, p. 77)

The third question pertinent to this monograph was, "What are the benefits of industrial arts to elementary school children?" Mrs. Heasley's response was:

. . .elementary school industrial arts providing six basic benefits for children. They. . .are:

1. An orientation to the world in which they live.
2. Opportunities to use and develop a variety of skills.
3. Opportunity for mind and body to work as a team and therefore develop levels of coordination.
4. Opportunity for analysis of parts to a whole.
5. Opportunity for interactions; student's interactions, teacher-student interaction, student-material-tool interaction.
6. Opportunity to organize, plan, create, and evaluate using a variety of media.

These benefits should be available to all children including exceptional children, the mentally retarded, the handicapped, and the deprived. Industrial arts experiences can benefit gifted children by providing a unique opportunity for them to utilize their academic knowledge and put their creative thinking into concrete form. The value of these children lies in the fact that they can work more independently and can individualize their own instruction. With limited guidance, they will often go beyond teacher expectations. To this end, they should not be handicapped by being required to proceed at "Whole-group pace."

Benefits to children in special education are much the same as with all children. However, when considering children of low intelligence, the need for greater direction from the teacher, a

pace set much slower, and simpler projects often suggested by the teacher would necessarily be a consideration. Creativity in most of these children will be limited.

When considering neurologically handicapped children, the teacher must plan for the unexpected and help these children accept something different. The values of elementary industrial arts. . . .are:

1. The opportunity to begin and follow to completion something of concrete value to the student.
2. The opportunity to be a part of a group. These children are often isolated for their basic schoolwork because they are so easily distracted. Being part of a group is important to them now and as adult's, no matter what the limitations.

Industrial arts for culturally deprived elementary children provides:

1. A variety of experiences not gained through normal childhood opportunities.
2. The opportunity to make and own something.
3. The opportunity to feel successful. This is especially important where children are having difficulty with school work because of a deprived background.
4. Experiences that develop an awareness of things in the world that they may never have been exposed to. (Hoots, et al., pp. 77-78)

Dr. Scobey stressed three points in her reply to this question:

. . .good teaching is much the same whether one is working with a normal child, a physically or mentally handicapped one, or a child from a cultural group that is different. The teacher must be concerned with individual differences, levels of learning and interest, and ways in which children can be motivated to discover ideas from themselves. The content of industrial arts, with its activities rooted in concrete experience, can contribute to such good teaching in several ways.

First, learning results best from concrete experience, and should develop from the concrete to the abstract. The exploration of industrial processes naturally involves much manipulation, experimentation, observation, and problem solving at the concrete level.

Second, study of the industry/technology of any group of people in any historical era or any geographical location provides a wide variety of activities suitable to varying interests, manipulative skills, and verbal capacities.

Third, there are a number of concomitant learnings resulting from well-taught industrial arts activites. There is training in the use and safety of tools and machines. As Mrs. Heasley has already pointed out, there is the opportunity to plan, research, solve problems of, and cooperate in the evaluation of the work of others. And finally, when children choose from so many kinds of pursuits in industrial arts, there is high motivation in active, manipulative learning. (Hoots, et al., 1971, p. 78)

Dr. Downs approached the answer to this final question from the research point of view:

> . . .All of the experimental research to date indicates that children who have experienced an elementary school industrial arts approach to learning have either made significantly higher gains in pupil achievement and retention or are statistically equal to children who have studied by more traditional approaches. Similar findings are also reported in these studies which measured student and teacher attitudes toward elementary school industrial arts. . . .Researches have reported such concomitant outcomes as: more outside reading, increased interest and motivation, improvement in silent reading comprehension, and improvement in work-study skills for children who experienced elementary school industrial arts activities. Such outcomes speak highly for this approach to education.
>
> . . .Children in special education, for instance, need first-hand experiences with the real world just as do all children, but the need for these children is multiplied because of their added learning difficulties. I, too, feel that industrial arts experiences must be kept on a very practical doing level through the use of the tools materials, and processes of our industrial/technological society.
>
> Industrial arts activities deal with things that have practical meaning, things that can provide a common ground from which teacher and pupil start together. Children from culturally deprived backgrounds especially need these first-hand experiences. Statistics reveal that a very high percentage of these children will become involved in occupations directly related to industry; therefore, we need to start early to give them rewarding and satisfying industrially-oriented experiences which will foster a positive attitude toward the world of work. Industrial arts activities provide an opportunity to develop a higher degree of self-confidence through practical and first-hand experiences, a benefit not often found in other disciplines. (Hoots, et al., 1971, p. 78)

The 1971 AIAA Conference provided a great wealth of information and significant statements regarding all phases of elementary school industrial arts. Since that time the following supporters have contributed to that well established foundation.

At the 1972 Conference of American Industrial Arts Association several presentations were made relating to the nature of industrial arts in the elementary school.

Dr. Robert Hostetter described in fourteen points the nature of the elementary school classroom in the English School. His fourteen points were:

1. The Head of an English school is autonomous.
2. No set curriculum must be followed.
3. The elementary schools of England use many manipulative materials, many teacher made.
4. There is none of the pressure. Children have time to think.
5. Children decide on their own activities.
6. There is much structure and planning on the part of the teacher; all kinds of activities are simultaneously available.

7. In England, teachers take courses to learn and not to get credits-there are weekend seminars.
8. There is a great deal of emphasis on beauty in craftsmanship and in aspects of the environment.
9. Teachers make great use of the local environment.
10. Teachers are respected as professional and reflect this in their interactions with each other and with children.
11. British educators have moved beyond verbalizing "child-centered education."
12. There is a happy, relaxed atmosphere in the schools and an obvious pleasure children evidence in being there.
13. Children are encouraged to learn in accordance with their individual capabilities.
14. The British elementary teacher is more concerned with the feelings of a child than the number of facts that he learns. (Hostetter, 1972, pp. 22-23)

John Geil (1972) at this same conference spoke about "Project LOOM" with a progress report. Project LOOM is an educational effort with the child as the center. LOOM stands for Learner Oriented Occupational Materials. Norma Heasley also presented a progress report on her funded research, "A Technology Exploration K-6."

Career Education and Elementary School Industrial Arts appear to be a co-theme of all the Council presentations in the 1973 AIAA Conference in Atlantic City, N.J. Since another monograph in this series is devoted to the role of career education, it will only be mentioned at this time.

In 1974, The American Council for Industrial Arts Teacher Education (ACIATE) devoted its yearbook to "Industrial Arts for the Elementary School." This book, edited by Robert Thrower and Robert Weber, contains the works of the more prominent contemporary supports of elementary school industrial arts.

In 1974 AIAA Conference programs presented by the ACESIA were devoted to the Career Education. See the Eugene Worley monograph for significant writing from this 36th Annual Conference.

The Cincinnati Conference of AIAA in 1975 saw a similar program emphasis in 1974 and 1973 with Career Education being the primary focus.

Dr. Calder's presentation on elementary industrial arts is not reproduced in this document because of its length, but it can be found in the 1976 Conference Yearbook on pages 22 through 25.

Also during the 1976 Conference, methods of preparing both pre-service and non-service teachers in industrial arts at the elementary school level were discussed in detail.

F. Milton Miller from the University of Missouri made a presentation regarding the philosophies, values, and typical programs of elementary industrial arts. His five major philosophies and eight values The myriad of programs which currently exist can be categorized into five major groups on the primary purpose which the program seeks to serve:

1. Industrial Arts as a means of developing habits, attitudes, problem-solving, and interests.
2. Industrial Arts designed to meet developmental needs of children.
3. Industrial Arts as a program involving students in making objects for the inherent value of the objects themselves.

4. Industrial Arts as a vehicle through which children acquire occupational awareness.
5. Industrial Arts as a means of correlating and enriching the elementary curriculum.

Some of the most relevant values or benefits to be derived by children who experience a program of elementary school industrial arts are:

1. Providing a means for satisfying the needs young children have to build, to construct, and to express themselves creatively. When children achieve success in a tangible form they build confidence and acquire a measure of self-realization.
2. Clarifying, enriching and broadening of concepts through first-hand experiences. The teacher is able to bring several of the senses to bear in a given learning situation, increasing the effectiveness of the learning situation.
3. Applying knowledge in a natural and realistic setting. The activities of planning, measuring, calculating, describing, drawing, designing, and others inherent in construction must utilize facts and skills gained in other phases of the elementary curriculum.
4. Developing an increased desire or drive to learn. Children may be highly motivated to read, to discuss, and to secure information needed to construct things that will be put to immediate use.
5. Developing problem-solving skills. Constructional activities give a realistic flavor to problem-solving which make it meaningful to young children.
6. Producing three-dimensional objects for observation and for use in dramatic plays.
7. Increasing understanding of the ways in which industry and technology affect the production of consumer goods. Through direct study of and experience with constructional processes, the child can better comprehend the processes of industrial production as well as materials of production. The "world of work" takes on a broader and more realistic meaning.
8. Development of certain behaviors, attitudes, and appreciations that have no direct relationship to the object being constructed. For example, to stick to a task until it is finished, to put tools and materials away for later use, to accept and profit from suggestions, and to assume responsibilities for a task that is important as well as individual. (Miller, 1976, p. 63)

Summary

This multi-part monograph attempts to bring together under one cover, the developmental stages of children and their behavior patterns and the role of industrial arts in the elementary school curriculum.

To the readers, this author would hope that they now have a better description of their students and also feel comfortable regarding the contemporary role of industrial arts in relation to the elementary school curriculum.

DEVELOPMENTAL CHARACTERISTICS				Characteristics of Appropriate Technological Activities
Age	Physical	Emotional/Social	Motor and Intellectual	
3	Very rapid growth Self Sufficient in eating Disposition indicates need for rest Toilet trained	Cooperative, happy Can share and take turn Peaceful with peers Needs attention and praise Imaginary friends Can be reasoned with	Can alternate feet going upstairs Rides three wheeled toys Spills at meal time are less frequent Throws overhead with body Able to draw recognizable shapes Can stand on one foot	Creative products as desired by children Sawing, nailing, drilling, and gluing are desirable activities Red clay with pincy pot and slab work Activities should stress large muscle development Jigs and fixtures will be needed to help guide tools e.g. miter box, drilling guide Materials such as corrugated cardboard, foamed plastic sheet, and thin, narrow strips of wood should be on hand Odd shaped, small piece of scrap lumber may be used for wood sculpture A large log, railroad tie, or fence post provides an excellent place for driving 4d or smaller common nails
4	Very energetic Can run, turn, and stop without falling Dramatic play Improved dexterity Reality-oriented Large muscle use predominate	Begins bossing, arguing, boasting and even fighting Home oriented Will become engrossed in individual activity Interest in sexual differences	Preoperational thinker No longer need to give full attention to common motor activities More thinking about what is being done—less about how-to-do-it	
5	Reduced rate of growth Legs lengthen in greater proportion Large muscles developing faster than small	Ready to engage in quiet activity Likes to be creative in constructing things to take home	Activities involving fine or close work should be avoided Enjoy block and plank construction Able to visualize things	
6	Growth rate reduced Body type becomes evident Hand-eye coordination continue to improve Large muscle skill more smoothly executed Fine motor skills need refinement Handedness established	May become stubborn, quarrelsome, and selfish More compatible with parent of opposite sex May identify with adults Likely to become dependent Can play in organized team	Motor interest tend to be the same as 5 year olds. They are executed with more skill Increased attention span and ability to concentrate Differentiate between reality and fantasy Great curiosity	

Age	Physical	Emotional/Social	Motor and Intellectual	Characteristics of Technological Activities
7	One of the most active periods in the childs development Becomes absorbed in games which involve running, jumping, chasing, or dodging Like wheel toys	Like small group play Behavior alternates between extremes of good and bad High regard for the opinion of teachers	Vocabulary is important to 7 year olds Their's contains about 2500 words Knows money Knows name of parents and address Begins reading	Use of small size regular tools become easier Products can be preplanned Jigs and fixtures are necessary to provide the desired accuracy Simple group projects can be useful Technological activities can be related to academic subjects to provide concrete experiences which are meaningful to this age child Cost of materials and the time required to do the work can be considered Some children will begin to develop hobby interest which will overlap school activities
8	Show regular growth Nervous habits may develop Hop scotch and jumping rope are popular	Begins to be influenced by peers Choice of friends not influenced by economics	Not able to construct things as well as desired Can tell time Understands basic math	
9	Fine motor development evident Writing improves Enjoys bicycling, swimming and skating	Signs of modesty Not good group member Respect property rights Behavior often better away from home	Able to handle multiplication and division Reduced interest in fantasy Special interest begin to replace totally play activities	
10	Slowed in growth Begins to be concerned about physical appearance Active Likes all types of play Adventuresome	Antagonism develops between the sexes Many students begin lifetime hobbies Works well in groups Eager to learn new skills and work with adults	Thinking in the concrete operational stage Begins to show interest in the past Can handle money May become a perfectionist Interested intools, skills, occupations, and products of the real world	

Age	Physical	Emotional/Social	Motor and Intellectual	Characteristics of Appropriate Technological Activities
11	Girls show rapid increase in weight and maturity Boys more active Both willing to work to learn new skills	Will play games as team member Privacy becomes an issue	Begins to plan ahead Interested in thoughts of others Enjoys gathering facts and presenting a case	Fine motor skills can be used effectively Strength much less a factor in choosing tools and materials Students will be more interested in planning activities They will be more responsible in obtaining materials, tools, and supplies Technological activities could relate to other areas of the curriculum
12	Many girls no longer equal to boys in strength Most children begin to exhibit individual preference for games and motor skills	Club memberships take on new meaning Team games become important	Critical of their own efforts Interested in earning money	
13	Less involved with games which require whole body activities Some children are awkward Most girls are aware of their developing figures	Social contacts widening Will want some privacy	Ability to reason sharpens Can deal with abstract ideas Can control emotional outburst Difficult age for parents and teachers	

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